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# *Hickory*


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# HICKORY

(*Carya* species)

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The combination of a high degree of strength, toughness, hardness, and stiffness in hickory has made it the world's foremost wood for tool handles and vehicle parts. As a shock-resisting wood, its equal has not been discovered.

The name "hickory" is commonly used as if there were but a single species. As a matter of fact, there are more than 30 species including the true hickories and the pecan hickories. Four species of true hickories furnish a very large proportion of the high-grade hickory found on the market. The wood of the pecan hickories is less valuable from the standpoint of strength and toughness.

Hickory is a tree of wide range. It grows in every State east of the Mississippi River and in several States on the western side. After several hundred years of use and abuse, hickory is still listed in the annual lumber production statistics of about 30 States, although the amount cut has diminished. This reduction is due in considerable degree to the substitution of steel for wood in vehicle parts, especially in automobile wheels, and has been influenced by the increasing difficulty of securing large quantities of high-grade hickory from any one region.

Compared with other important timber trees, the hickories are slow growing, have a low yield per acre, and are exacting in their soil and moisture requirements. On the other hand, their tolerance of shade, long life, and ability to reproduce readily from both seed and sprout are factors favorable to the species holding its own in the forest. Exceptional hickory trees sometimes reach a diameter of 4 feet and a height of over 140 feet and attain an age of 350 years.

**Nomenclature.**—The common names of the true hickories of commercial importance, together with the Latin name of each and several local names, are as follows:

| | |
|---|---|
| Shagbark hickory (*Carya ovata* syn. *Hicoria ovata*). | Shagbark.<br>Shellbark hickory.<br>Scalybark hickory.<br>Upland hickory.<br>Walnut. |
| Shellbark hickory (*C. laciniosa* syn. *H. laciniosa*). | Big shellbark.<br>Western shellbark.<br>Thick shellbark.<br>Bottom shellbark.<br>Kingnut. |
| Pignut hickory (*C. glabra* syn. *H. glabra*). | Bitternut.<br>Black hickory.<br>Broom hickory.<br>Switch-bud hickory.<br>White hickory. |
| Mockernut hickory (*C. tomentosa* syn. *H. alba*). | White heart hickory.<br>Bullnut.<br>Black hickory.<br>White hickory.<br>Hognut. |

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The pecan hickories include pecan[1] (*Carya illinoensis* syn. *Hicoria pecan*), water hickory[2] (*C. aquatica* syn. *H. aquatica*), nutmeg hickory (*C. myristicaeformis* syn. *H. myristicaeformis*), bitternut hickory[3] (*C. cordiformis* syn. *H. cordiformis*), and several other species of less importance.

**Distribution and growth.**—The ranges of the four true hickories of commercial importance are shown in figures 1 to 4. Hickory once grew in commercial quantities from Connecticut west to southern Michigan, and south to Florida and eastern Texas. By far the


FIGURE 1.—Range of shagbark hickory (*Carya ovata* syn. *Hicoria ovata*).

larger part of the commercial hickory north of the Potomac River and east of the Allegheny Mountains has been cut. West of the Alleghenies and north of the Ohio River only a few scattered remnants of the original stands are left. The bulk of the present supply lies in the lower Mississippi Valley region. There has been some replacement of the original stand with second growth in the regions most heavily cut over.

[1] The most important of the pecan group, because of the value of its nuts. Frequently called "sweet pecan."
[2] Frequently called "bitter pecan."
[3] Frequently called "pignut."

The hickories are comparatively slow growing, especially the true hickories, which normally increase in diameter about one-half as fast as white oak. Mature trees of shagbark and pignut are generally from 200 to 300 years old with a diameter of about 2 feet and a height of about 110 feet. It takes shagbark and pignut about 5 years to reach a height of 17 inches. After 30 years' growth they are generally from 3 to 4 inches in diameter and 20 to 30 feet high, and after 100 years from 12 to 14 inches in diameter and about 70 feet high.


FIGURE 2.—Range of shellbark hickory (*Carya laciniosa* syn. *Hicoria laciniosa*).

Hickory grows naturally in mixture with other species, especially with the oaks. For their best development the hickories need a deep fertile soil that is fairly moist, although they will grow on soils that are dry and sandy. The commercial hickories rank as follows in their moisture requirements, beginning with the species that needs the least for good development: pignut, mockernut, shagbark, shellbark. Hickories require but little light in early life and have the faculty of recovering rapidly from long periods of suppression.

Squirrels eat a considerable portion of the hickory nuts, but they bury some for future use, and these frequently grow. During the

first few years of growth, a seedling spends most of its energy in developing a taproot. At the end of 3 years this taproot is about 2½ feet long. When seedlings are damaged by fire or grazing, as frequently happens, they sprout readily and repeatedly even if burned or broken a number of times.

**Supply.**—The only available estimate of the total stand of hickory in the United States was made in 1919.[4] The combined stand of true hickory and pecan hickory was placed at 16 billion board feet and distributed as follows:

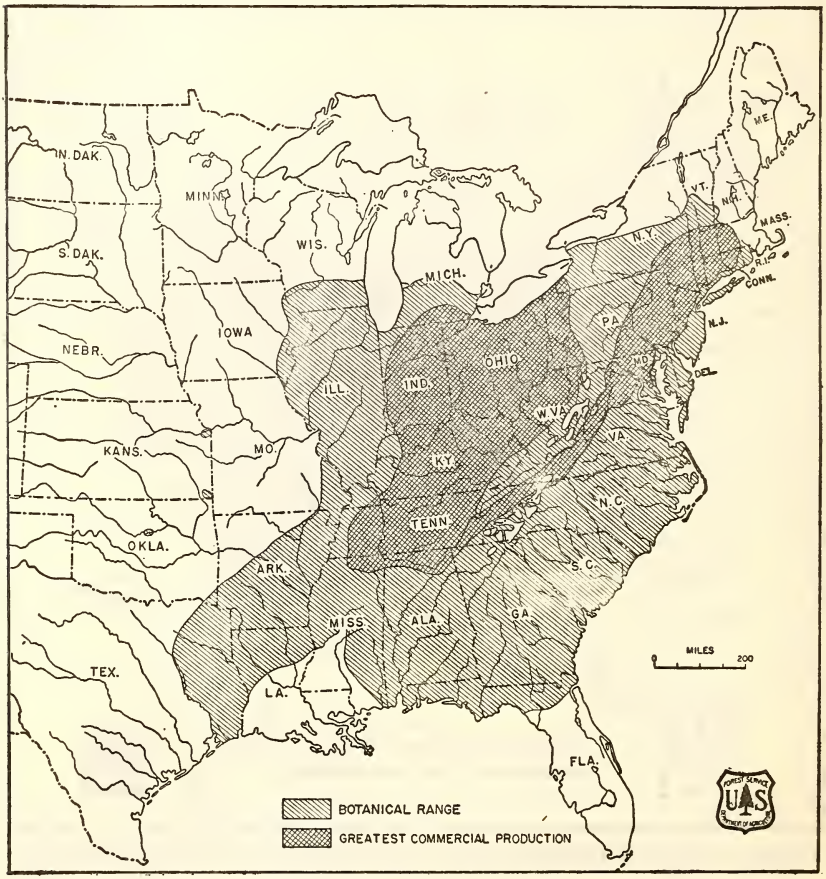


FIGURE 3.—Range of pignut hickory (*Carya glabra* syn. *Hicoria glabra*).

| | *Board feet* |
|---|---|
| Lower Mississippi Valley region | 7,000,000,000 |
| Central region (timber largely in woodlots) | 3,000,000,000 |
| Southern Appalachians | 2,500,000,000 |
| Atlantic and Gulf Coast region | 2,500,000,000 |
| Remainder of range | 1,000,000,000 |

[4] This is a very rough estimate. See SPARHAWK, W. N. SUPPLIES AND PRODUCTION OF AIRCRAFT WOODS. Ann. Rpt. Natl. Advisory Comm. for Aeronautics 5 (Rpt. 67) : 409–471, illus. 1919.

A forest survey recently conducted in the Southeastern States[5] showed the occurrence of hickory of saw-timber size in sufficient quantities to justify listing it separately from other species in parts or all of the States of Louisiana, Arkansas, Mississippi, Texas, and Oklahoma. These States comprise a region which closely approximates the Lower Mississippi Valley region covered in the 1919 estimates. The total stand of hickory in the States listed was 4,655,800,000 board feet[6] as compared to 7,000,000,000 board feet in the 1919 estimate. This is a reduction of about one-third and if applied to the 1919 esti-


FIGURE 4.—Range of mockernut hickory (*Carya tomentosa* syn. *Hicoria alba*).

mate for total stand would reduce it to 10,667,000,000 board feet.[7]

The stand of hickory in the Lower Mississippi Valley region, according to forest survey figures, was made up of 1,688,000,000 board feet of true hickory and 2,967,800,000 board feet of pecan hickory. Probably the stand of pecan hickory outside of the Lower Mississippi Valley region does not exceed 1,000,000,000 board feet. This would bring the

[5] Conducted by the Southern Forest Experiment Station of the Forest Service, U. S. Department of Agriculture, in 1936–38 as part of a Forest Survey of the United States.

[6] Based on International ¼-inch scale.

[7] Forest surveys covering regions where hickory grows in commercial quantities have been made only in the Southeastern States.

total stand of the pecan hickories to approximately 4,000,000,000 board feet and leave 6,677,000,000 board feet as a very rough estimate of the stand of the true hickories. It would also indicate that there was about 5,000,000,000 board feet of true hickories growing outside of the Lower Mississippi Valley region.

**Production.**—The reported production of hickory lumber by sawmills, including sawed squares and dimension stock, declined from 1919 to 1940 and then increased markedly because of demands brought about by the war. In 1899 [8] production was 126 million board feet (fig. 5). By 1909 it had risen to a maximum of 334 million board feet. After that it decreased irregularly, and in 1932—a year of business depression—it fell to the all-time low of about 8 million board feet. By 1940 reported production was 35 million board feet, and in 1942 it reached 120 million board feet.[9] The average annual production of hickory lumber for the 10-year period 1933–42 was about 40 million board feet.

The leading States in the production of hickory lumber in 1899 were Indiana, Ohio, and Illinois. A few years later production moved southward, and Arkansas, Tennessee, and Kentucky took the lead. In 1942 the four leading States were West Virginia, Tennessee, Mississippi, and Kentucky. In that year West Virginia produced 23 percent of the total hickory lumber cut, and the four States combined furnished nearly 50 percent.

In addition to the hickory cut into lumber, squares, and dimension stock at sawmills, a considerable amount of hickory in the form of short logs, bolts, or billets is shipped directly to factories (principally handle factories) where finished products are made. Such material is not recorded in the lumber production statistics obtained from sawmills. The volume of sawed stock produced at these factories is probably equal to at least one-half of the volume of lumber and dimension stock produced at sawmills. The average annual production of hickory lumber and dimension stock from all sources in recent years is estimated roughly at 60 million board feet.

Another major use of hickory is fuel wood. Annual consumption was estimated some years ago at 150,000 [10] cords, equivalent to approximately 45 million board feet.[11] The total annual cut of hickory for all purposes has probably averaged about 120 million board feet in recent years.

**Properties.**—The annual growth rings of hickory are distinct. The sapwood is white and generally from 2 to 4 inches wide in trees about 12 inches in diameter. The heartwood is reddish brown. The wood of the true hickories is rated very heavy,[12] very strong when used as a beam or post, very stiff, exceedingly high in shock resistance, and very hard. Some woods are stronger than hickory and others are harder,

[8] The first year for which separate statistics for hickory are available.

[9] The marked increase in reported production since 1940 may be attributed not only to war demands but also to a more thorough coverage of the sawmills where hickory lumber and dimension stock are produced.

[10] This is slightly less than one-half of 1 percent of the total quantity of fuel wood cut on farms in 1924. In 1910 it was estimated that one million cords of hickory were used for fuel annually.

[11] A cord of hickory fuel wood is considered to contain 300 board feet.

[12] The average weight of each of the four true hickories of commercial importance in an air-dry condition (12 percent moisture) is as follows: shagbark hickory, 50 pounds per cubic foot; shellbark hickory, 48 pounds per cubic foot; pignut hickory, 52 pounds per cubic foot; mockernut hickory, 51 pounds per cubic foot.

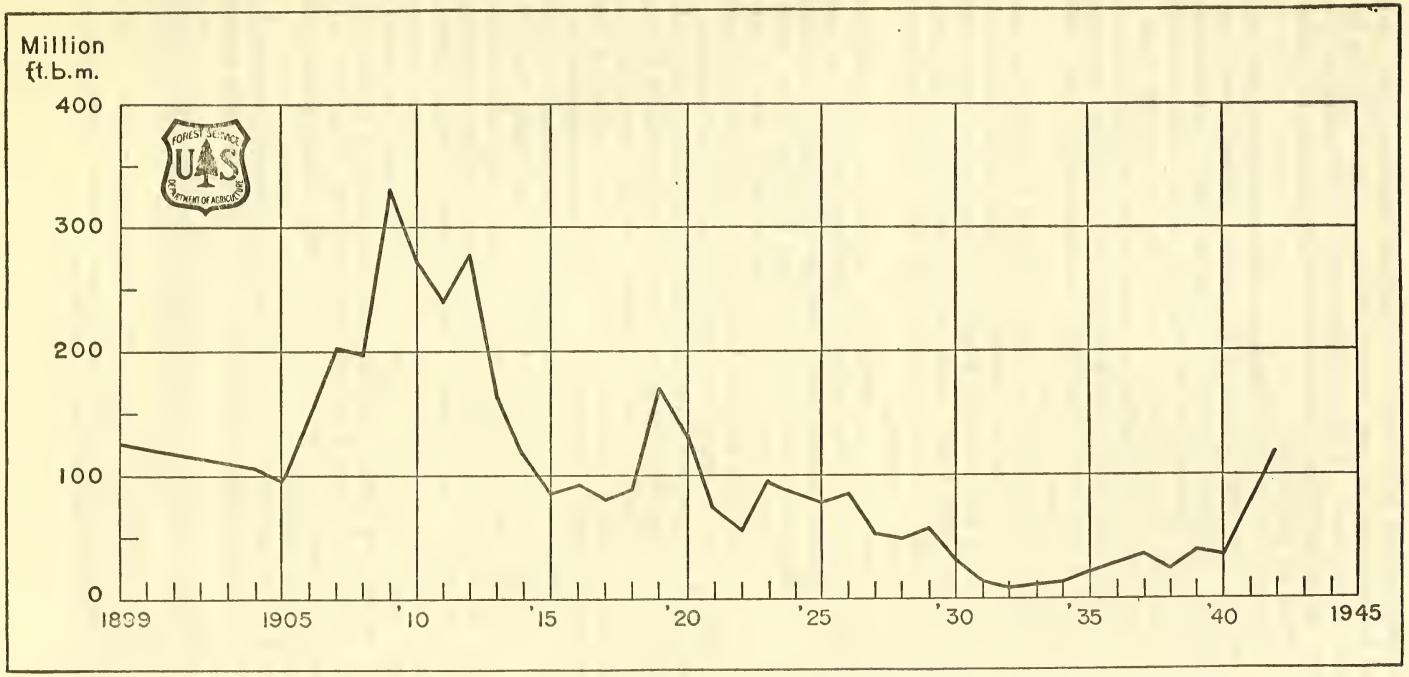


FIGURE 5.—Lumber production of hickory (shagbark, shellbark, pignut, and mockernut), 1899–1942.

but the combination of strength, toughness, hardness, and stiffness possessed by hickory has not been found to the same degree in any other commercial wood. Taking the strength of white oak as 100, that of hickory is about 130. The shock-resisting ability of hickory is over twice that of white oak.

Hickory has a very large shrinkage, and considerable care must be used in drying the wood in order to avoid checking, warping and other seasoning defects. In nail-holding ability it ranks high but has a tendency to split under the action of nails. The wood can be glued satisfactorily with moderate care in the gluing operation. All of the hickories lack durability when used under conditions favorable to decay. In this respect they are similar to the birches and maples. The heartwood of mockernut hickory is classed as moderately difficult to penetrate with a preservative.[13]

Hickory trees [14] frequently have holes drilled through the bark by woodpeckers. These holes or "birdpecks" bring about a discoloration of the wood known as "streaks" which, at least when they occur in moderation, have little if any effect on the mechanical properties of the wood but do affect its appearance and cause the rejection of a considerable amount of material.

Hickory logs are liable to attack by a number of wood-boring beetles; and the sapwood, even after it has been seasoned and manufactured into various products, is still subject to damage from powder-post beetles. Various methods of treating hickory have been developed to prevent insect attack or to check damage not too far advanced.[15] These methods include treatment with boiled linseed oil and the application of varnish or paraffin as preventive measures, and saturation with kerosene and other chemicals and heating to 180° F., or steaming to kill the beetles in infested material not too badly damaged.

There is an unfounded prejudice against the heartwood of hickory. Specifications frequently place white hickory (sapwood) in a higher grade than red hickory (heartwood). Conclusive tests have shown that the transformation of sapwood into heartwood does not affect either the strength or toughness of the wood and that, weight for weight, sound red hickory is just as strong as sound white hickory. The density or weight of a piece of dry hickory is the best criterion of its strength regardless of color. Rapid-growth hickory with not more than 17 rings to the inch is generally the heaviest and strongest.

**Principal uses.**—Statistics collected in 1940 showed that nearly 80 percent of the hickory used in the manufacture of wood products went into tool handles, and about 7 percent into vehicles. The next largest uses were agricultural implements, sporting and athletic goods, picker sticks,[16] and lawn furniture.

Hickory handles are used especially for striking tools such as hammers, axes, hatchets, picks, and sledges. For this use the combina-

[13] Mockernut hickory is the only one of the hickories on which information on heartwood penetrability is available. The sapwood of most species is comparatively easy to penetrate with a preservative.

[14] Both true hickory and pecan hickory.

[15] SNYDER, T. W. PREVENTING DAMAGE BY LYCTUS POWDER-POST BEETLES. U. S. Dept. Agr. Farmers' Bul. 1477. 14 pp., illus. 1938.

[16] Used in weaving operations to throw the shuttles back and forth. Hickory is the only wood that has been found satisfactory for this exacting use.

tion of strength properties found in hickory has made it the outstanding wood. Hickory handles have helped greatly to make the American ax favorably known throughout the world.

A widely used specification for hickory handles calls for the highest grade to be of heavy-weight material (55 pounds or more per cubic foot at 12-percent moisture) with not more than 17 annual rings per inch and free from all defects and discoloration except small streaks. The second grade requires material of at least medium weight (46–55 pounds per cubic foot) with not more than 22 rings per inch and free from defects and discoloration, except medium streaks. The third and lowest grade requires material of at least medium weight, but allows a greater number of rings per inch, a few defects, and more discoloration. The specifications have no requirements as to the natural color of the wood used in the handles; that is, handles of any grade may be made or heartwood (red hickory) or sapwood (white hickory), or may contain both heartwood and sapwood.

Vehicles, both motor and nonmotor, formerly provided by far the largest outlet for hickory. In recent years the wide use of steel in automobile construction, especially the virtual elimination of wheels with wooden spokes, has resulted in a marked drop in the consumption of hickory in vehicle construction.

A considerable proportion of the cut of hickory is normally exported both in finished and unfinished form. Probably one-third of the total output of tool handles in past years was shipped to Germany, South Africa, and Australia.

Special hickory products which call for a wood with a high degree of strength, stiffness, and toughness, are sucker rods (long, straight-grained strips used in well pumps), picker sticks (used in cotton and silk mills), skewers, ladder rungs, gymnastic bars, scythe snaths, and skis. The exacting requirements of many of the uses of hickory naturally result in considerable waste of raw material. This waste is further augmented by the prejudice against red hickory and the rejection of material slightly discolored, and is estimated to approach two-thirds of the volume of the logs or bolts used.

Hickory is one of the best American fuel woods and is also one of the best woods for smoking meats. A smouldering fire of blocks of green hickory smothered with sawdust of the same material imparts an excellent flavor and greater keeping qualities to meat suspended above it.

The nuts of the shagbark hickory are the small hickory nuts of commerce. Those of the shellbark hickory are much larger—often 1½ inches in diameter. The shells are thick, but the meat is sweet. Nuts of the pignut hickory are thin shelled, and the meat is apt to be bitter. Mockernut hickory has a thick-shelled nut with a small kernel.

Table 1 shows the amounts of hickory used in the manufacture of various classes of products in 1912, 1928, 1933, and 1940. The table includes hickory in the form of lumber (including sawed squares and blanks) and logs (including bolts and billets).

TABLE 1.—*Hickory used in the manufacture of wooden products*

[Thousands of board feet]

| Product | 1912 | 1928 | 1933 | 1940 |
|---|---|---|---|---|
| Airplanes | 2 | | | |
| Agricultural implements | 9,860 | 4,263 | 515 | 2,934 |
| Boot and shoe findings | 25 | | | |
| Boxes, baskets, and crating | 768 | 947 | 247 | 321 |
| Butchers blocks | [1] 1,310 | | [1] 117 | |
| Car construction and repair | 1,227 | 258 | 67 | 36 |
| Conduits, pumps, wood pipe | 925 | 190 | 41 | 393 |
| Dairy, poultry, and apiary supplies | [2] | 143 | 215 | 740 |
| Dowels and skewers | [3] 31 | [3] 1,416 | [3] 42 | 209 |
| Electrical equipment | | 9 | | 29 |
| Fixtures | 26 | 49 | | |
| Flooring | [4] | [4] | | |
| Furniture | 2,036 | 1,616 | 612 | 1,076 |
| Handles | 120,419 | 63,041 | 35,052 | 58,889 |
| Instruments, musical | 1 | 31 | | |
| Instruments, professional and scientific | 971 | 339 | 42 | 25 |
| Ladders | [2] | [2] | 669 | 496 |
| Machinery | 1,929 | 20 | 278 | 6 |
| Patterns and flasks | | | 10 | 1 |
| Pipes, tobacco | | 27 | 24 | 4 |
| Playground equipment | 100 | 50 | 2 | |
| Printing material | 21 | | | |
| Refrigerators | [5] 150 | | | |
| Rollers, shade and map | 2 | | | |
| Sash, doors, general millwork | [6] 2,499 | [6] 1,004 | [7] 3 | [7] 2 |
| Ship and boat building | 110 | 66 | 2 | 18 |
| Shuttles, spools, bobbins, looms | [8] 872 | [8] 1,017 | [8] 50 | [8] 1,558 |
| Signs, scenery, displays | | 2 | | |
| Sporting and athletic goods | 4,944 | 1,373 | 564 | 2,581 |
| Surgical supplies | 40 | | | |
| Toys | | 30 | | 29 |
| Trunks and valises | 174 | | 2 | |
| Vehicles, motor | [9] | 49,522 | 6,082 | 1,350 |
| Vehicles, nonmotor | 239,492 | 18,257 | 3,880 | 4,205 |
| Woodenware and novelties | 1,670 | 2,050 | 285 | 296 |
| Total | 389,604 | 145,720 | 48,801 | [10] 75,198 |

[1] Includes skewers.
[2] Included in "Woodenware and novelties."
[3] Skewers included in "Butchers blocks."
[4] Included in "Sash, doors, general millwork."
[5] Includes kitchen cabinets.
[6] Includes planing-mill products such as flooring, siding, ceiling, etc.
[7] Planing-mill products not included in 1933 and 1940 canvasses as in 1912 and 1928, except flooring which is listed separately.
[8] Practically all picker sticks.
[9] Included in "Vehicles, nonmotor."
[10] This total includes 54,449,000 board feet of lumber, sawed squares and blanks and 20,749,000 board feet of logs, bolts, and billets.

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